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From W. R. Lawrence, Esq., C. S., Under-Secretary to the Government of India, To The Secretary to the Governments of Madras, Bombay, Bengal and the Punjab, the Chief Commissioner, Central Provinces, Ajmere and Coorg, Revenue and Agricultural Department (Agriculture), Circular No. 46—16-28 A, dated Simla, the 26th August 1887.

Sir,—In continuation of the previous Circulars noted in the margin, I am directed to forward for information a copy of a report by Dr. E. Bonavia on the cultivation of the date-palm in India and to suggest that it should be communicated to Agricultural Departments and to District Officers and others who are interested in the experimental cultivation of the palm.

No. 3—15-9 A, dated the 1st May 1886.
No. 52—15-21 A, dated the 20th September 1883.

2. As Dr. Bonavia is convinced that plants raised from seed will generally yield true varieties, the Government of India is of opinion that future importations should ordinarily be confined to seeds as they can be readily obtained and at little expense. The Government of India is willing to assist in procuring from Persia or Egypt any seeds which may be required for cultivation and to make an aggregate annual grant not exceeding Rs. 500 for this purpose, but in consideration of the importance of date culture in India it is hoped that———will be able to contribute towards the cost of importing seeds and it is now desired that the quantity of seed required by———together with the amount of money if any which can be contributed towards the cost of purchase and freight may be communicated to the Government of India as early as possible.

I have, &c.,
W. R. LAWRENCE,
Under-Secy. to the Govt. of India.

Dated London, the 4th July 1887.

From—Dr. E. Bonavia, Brigade-Surgeon, Indian Medical Department (on leave), To—Secretary to Government, N.-W. Provinces and Oudh.

SIR—I have the honor to submit, to the Government of the North-Western Provinces and Oudh, the following information regarding the date-palm.

2. Convinced as I am that this useful tree, if largely introduced in India, would eventually be of great benefit to the people, I have collected information about it from all the countries where it is extensively grown. This information I now beg to place at the disposal of the Government of India.

3. As there may still be some doubts in India whether *seedling* date-trees are of any value, I paid particular attention to this point in making inquiries. In a letter from Sir R. Lambert Playfair, Her Majesty's Consul-General for Algeria and Tunis, dated Algiers, the 11th January, 1887, the following is stated: "From what you say, I have no doubt that off-sets could be sent to India without much difficulty; but really there is very little necessity for making the experiment. Seeds are sure to germinate, and the experience of the Arabs here is, that the fruit of seedlings is quite as good as that of trees propagated by suckers. The only objection is, that there is the risk of obtaining an undue proportion of male trees." Then C. Regnier in his "Observations sur le Palmier Dattier, et sur sa culture en Egypt," says: "Seedlings sometimes produce bastard varieties. More frequently they perpetuate well-known varieties. At other times *new* kinds are raised, which are afterwards propagated by off-sets."

4. The foregoing is good evidence of the value of seedling date-trees. We have, however, proof of it in India already. Before leaving India on leave, I sent, to the Director of the Royal Gardens at Kew, a fine collection of dates, solely from seedling trees grown in Oudh and Multan. They are now in the Economic Museum at Kew. Moreover, what Sir Lambert Playfair considers as a slight objection to raising seedling trees, I would consider an advantage, at first, for India. Fertilization of the female flowers by the pollen of the males is not generally known yet in India. An excess of males among females would therefore ensure a crop, and would not disappoint the growers. In course of time India would possess fine varieties of date-trees, and then it could easily furnish its own off-sets of female trees, and fertilize them, as they do in other countries. In addition, the great advantage of seeds just now is, that they cost comparatively little to import, and can be made into fruit trees, with less trouble than off-sets, so that all the places in India where the date-tree can be grown with advantage may be rapidly furnished with this important tree at a small cost.

5. The following interesting extract about the date-tree is from a recent book, called "Tunis: the Land and its People," by Chev. de Hesse Wartegg. I give it in order to show what can be done with the date-tree. At chapter 13, page 278, he says: "South Tunis—on both sides of the large salt marsh, Sebcha Pharaon, which latter reaches far into Algiers—is a beautiful country of palms, which is not surpassed by anything on the shores of the Nile. Thirty oases lie close together in a row, and divide the desert land of the ancient Numidia from the large salt lake, which is dry during nine months of the year. This palm region *par excellence* is known in Africa under the name of 'Beled-el-Djerid,' and no fruit is valued higher than the sweet large and juicy 'Djerid' date, which also fetches the highest prices in the European markets." At page 279 he says: "The slender stems of the palm-trees often reaching a height of 100 feet, display their transparent rustling canopy. The sun is a necessity to them, and while they rejoice in his burning rays, they keep the earth at their feet in cool shade, and thus aid the growth of the figs, oranges, lemons, almonds, olives, and pistachio trees. The latter grow between and under the palms, the damp ground beneath being covered by the most luxuriant growth of herbs and grass. It is, therefore, a threefold vegetation." At page 280 it is stated that "of these oases, Gaffa is the largest, and possesses a palm-forest of about 200,000 trees, and is inhabited by from 3,000 to 4,000 Arabs and Berbers. In the oases of 'El Gettar,' water is not nearly so plentiful, and camels raise it with difficulty from draw-wells; but the date palm is here so exclusively the source of livelihood of the few hundred inhabitants, that there is no choice left to them, and they must get water at any price. In 'El Gettar' a palm-forest extends over a tract of land three kilometers long, and the entire region north of the 'Sebcha Pharoan' possesses no less than a million and-a-half of palm trees, with as many olive, orange, and almond trees growing between." Then south of the Great Shott "is the extensive district of the oases of Nefzani, with palm-forests of more than 300,000 trees, and with from 18,000 to 20,000 inhabitants, living in 40 villages."

6. The foregoing information is of some importance. It shows (*a*) that the date-tree flourishes in saline soils. It would, perhaps, be more accurate to say that *some varieties* of date-trees do so, as there are hundreds of kinds. There does not appear to be any doubt, however, that the "Djerid" date of Tunis is a very fine kind, and fetches a good price in the European markets. (*b*) It gives some idea of the population that can live almost exclusively on the produce of these date forests, bartering any surplus fruit for other commodities. (*c*) It shows that not only where water is near the surface can the date-palm be grown, but also where water is obtained with great labour. (*d*) It shows that where date-trees can be grown, and where water is easily obtained, there also oranges, lemons, and other fruit-trees can be readily grown on a large scale under the shade of these palms and between them.

7. In India, both in Rajputana and in Sindh, on both sides of the Indus, the conditions are such that if Arabs and Berbers had possession of those tracts of country, they would probably, in less than 50 years, turn them into gardens.

8. In my investigations, nothing appears to be more clear than that there are *two distinct classes* of dates—(1) those that ripen on the tree, or soon after they are plucked, and are those which are met with in European fruit-shops; and (2) those which do *not* ripen like the above (a raisinified date), but remain hard and crisp, and are either eaten in that condition, or cured in various ways.

9. The following information, by Senor Don Maximo Laguna, was courteously furnished by the Secretary to Her Majesty's Legation in Madrid: "The few varieties distinguished in Elche (Spain) are based on the character of the fruit. That which is most esteemed is the one producing the date called '*Candix.*' This ripens and sweetens *on the tree.* The others are of a yellower colour, harder, and with a smooth skin. In order that the latter may be fit to eat, it is necessary to smear them with vinegar, and cover them up for two days. Then they become sweet and agreeable. They will keep in this state for five or six days, after that they spoil, so that only the quantity immediately needed is prepared. Although in Elche artificial fertilization is practised by attaching male flowers to the female bunches, more frequently male trees are planted with females: one male to two or three females and at a little distance from them."

10. There is a notion that the date-tree is unsuited to a damp climate, and that it can only ripen fruit when its roots get into sub-soil water and its head remains in a dry, heated atmosphere. This notion may have arisen in two ways—*first*, because the date-tree may have first been known only under such conditions and being intimately associated with Arabs, who inhabited regions mostly under such conditions; *second*, because the *best* varieties of dates, the choice ones of European markets, are those probably grown under such conditions. But it does not at all follow that an edible and very nourishing and useful date cannot be grown under totally different conditions.

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11. In passing recently through Egypt I saw, along the railway, a number of date-trees, with their fruit only lately gathered, with their roots in water still lying on the land from the recent inundation of the Nile. Moreover, in Egypt the date-tree has been associated with man from a very remote period. In the book called "*Viâ* Cornwall to Egypt," by C. F. Gordon Cumming, at page 137, I find the following: "In the time of the Romans, the Egyptians gave receipts for taxes on fragments of tiles: about 1,600 years ago. A number of them are receipts for payments of poll-tax, cattle-tax, *palm-tree tax*, &c. One receipt for a poll-tax is dated A. D. 103-104." ..... "After the conquest of Assyria, 1,500 years before Christ, large quantities of bitumen were paid in tribute to the Pharoahs, and with this the mummies were thenceforth prepared. The bodies of the poor were merely saturated with natron or bitumen, baked in an oven, swathed in woollen rags, and then tied up in a rough mat of *palm leaves* or '*papyrus*.' Thus they were laid in rows of thousands, in the great sepulchres." In Egypt, therefore, we have not only the annual regular rising of the Nile, inundating more or less the whole country on both its banks, but also the date-palm known there for hundreds—perhaps thousands —of years before the Christian era. It is in Egypt, therefore, if anywhere, that we ought to find evidence of this useful tree having, in the course of ages, suited itself to almost two diametrically opposed conditions of life. In order to obtain some proof of this, I wrote to the Head of the Public Works Department of Egypt for information on the date-tree of Egypt. Major Ross, R. E., of the Indian Irrigation Department, very kindly issued a circular to a number of officials, who were in a position to afford information on this matter, giving the questions which I had sent. Colonel Moncrieff, with his letter dated 15th June, 1887, very courteously forwarded all the notes collected to me, and added a memorandum of his own on each, regarding the reliability, carefulness, and power of observation of the sender. The officials who collected this information are—

Mr. Biancardi, for many years Traffic Manager of the Railway, and a great horticulturist;
Bechara Takla Beg, a Syrian Editor of a well-known Arabic newspaper;
A man of the Domains, a very practical native;
Mr. E. W. P. Foster, of the Bengal Irrigation Department, a most careful and pains-taking officer, whose statements are pretty sure to be the result of close inquiry;
Mr. Marshall Hewat, an Engineer of a good many years' residence in Egypt;
Dr. Harvey, of the American Mission, an old resident in Egypt;
Wilson Bey, a shrewd Scotch Mechanical Engineer: he has had many years' experience of Egypt;
Captain R. H. Brown, R. E., of the Bengal Irrigation Department, a careful and accurate man; and
Mr. Arnold Perry, a young English Engineer.

12. Colonel Scott Moncrieff, R. E., Under-Secretary of State, Public Works Department, Egypt, in forwarding the above notes, and in reply to a question of mine, states: "The Nile rises with wonderful regularity in July. In September it is over nearly all the country, attaining its maximum in Cairo about 15th October, after which it goes down very fast, and the inundation is over early in November." It should be noted that from July to November is exactly the period in which the dates swell, color, and ripen, and all those date-trees which happen to be on inundated ground have not only their roots under water, but are surrounded by a damp atmosphere, from the immense sea of water which the Nile makes. I should say during that period, which is the hottest of the year, the atmosphere would be similar to that of the North-Western Provinces of India in the rains, if not generally more damp.

13. In order to avoid repetitions I shall here give only a *résumé* of all the notes received; all say that the *best* dates are produced by trees on dry land, which is irrigable, and sometimes also on trees which are close to the desert; that some of the best kinds of dates are grown on sandy lands, which can be irrigated when required; that those on low lands, to which water has access, are not bad, but they are not so good as the foregoing, and that whether the air and soil are damp or dry makes little difference. In the latter case, they should be irrigated as often as necessary. The trees planted in Rosetta, Aboukir, Ramleh, and Gabbary are all in a damp atmosphere, and bear also good qualities of fruit. Mr. Foster says that "in Rosetta the best kinds are *Zaghloul* (red) and *Samuni* (yellow), cultivated on high sandy hills. The roots are probably in moist soil, as the spring level is high after floods. These, as a rule, are never irrigated. There are, however, lots of dates grown on lower, though sandy soil, which have improved very much in quality since the opening of the Rosetta canal has rendered irrigation easy. The drier the soil with surface irrigation, it appears the better is the produce. In Gizeh, date-trees are on lands subject to flooding on the basin system. Water may remain over the

roots of the tree for 70 days without injury (!) ; a longer period will damage the produce. It is better, however, to reduce the time of inundation. From 20 to 70 days' flooding is *ordinary*. Unless flooded, the outturn of fruit is small, and quality is inferior. Three kinds of dates are grown in Gizeh, the best of which is *Sewi*, a yellow variety ; *Amhat*, a very moist kind, turning from yellow to dark brown when ripe ; and *Hayani*, a red variety. The best dates of Gizeh are grown in yellow clay ; sandy soils and ordinary black Nile deposit do not produce so good a date." Mr. Biancardi says : "I have seen plantations accidentally inundated, with their crop injured. Too much water is not required. We have solitary trees in the middle of the canals. They look healthy, but bear no fruit." He does not, however, mention whether these solitary trees happen to be males or females ; or if the latter, whether the people take the trouble to fertilize them in the midst of the canal ; solitary trees can be found under the most favorable conditions, and still remain fruitless. Dr. Harvey says : "Date trees are sometimes inundated for one to three months, and that the trees are not injured by excess of water ; and that trees on inundated ground produce most and best. On this point, however, some say that there is little difference whether the trees are inundated or not, a dry soil and a dry atmosphere are not essential to the production of a crop of dates."

14. Without taking into consideration the fact that the date-trees in Oudh have undoubtedly produced very fine fruit, it appears to me evident from the replies sent from Egypt that, although a dry climate and soil, even where irrigation is difficult, will perhaps produce the best date, which will dry on the tree, and become the most suited for long keeping and for exportation ; a damp soil and atmosphere —nay, an excess of these conditions—will not only, as a rule, not injure the date-tree, but will produce an edible and valuable crop. There can hardly be any doubt that in the thousands of years during which the date-tree has been associated with man in Egypt, different kinds have come into existence, some of which are suited to a dry soil and atmosphere, and some to conditions which are exaggeratedly the reverse of the above. It is not improbable that some of these Egyptian varieties might be found suited also to the damper climates of India, such as Bombay and Bengal.

15. All the replies say that, usually, there is no such thing as a bunch of dates ripening *all at the same time*. On the driest land and on the borders of the desert, the dates are allowed to remain until the whole bunch is ripe ; but in most places the dates of each bunch are gathered in several pickings, either by hand, or the bunch is shaken over a large net slung under it. They are either eaten as they come ripe off the tree, or dried in the sun, and prepared in various ways. Often the bunches are cut off in their red or yellow stage, and sold in the bazaars. They are eaten by the people, although they are astringent and have no sweetness. When the individual dates on a bunch begin to ripen, the whole is often cut off and hung in the houses of both natives and Europeans. The dates are then picked off and eaten, as they ripen. A kind of jam is made of the unripe fruit, or they are salted and eaten as condiment, and the shrivelled ones are removed from the bunch, to give strength to the remainder.

16. The weight of dates from a full-grown tree is given from 50 to 500 lbs., according to circumstances and the care given to the trees. The life of a date-tree is given from 80 to 100 years, and that it is certain that some trees now standing are between 100 and 200 years old. Their life generally comes to an end by being blown down in a storm. As long as they live, with proper care, they produce abundantly every year.

17. The cultivation of the date tree is very extensive in Egypt, and the crop is immense. Most of the natives live for fully three months both on the unripe and on the dry dates. The dates are cheaper to them than common bread, and the poorer classes keep the date-stones, and use them as fuel. Many uses are made of the trunks, leaves, leaf-stalks, fruit-stalks, and the fibre of date trees. Vinegar and spirit are made from the fruit. The trees which are most cared for give the largest and best crops. Pigeon-dung is largely used for manuring date-trees, so are horse and other manures utilized. Dust from old villages is also used. I fancy this corresponds to the *nona* of Indian cultivators. It is probably a compound of *nitrate of potash*. Manure is mostly used in Lower Egypt. In Upper Egypt, the tilling of the soil between the date trees is supposed to supply the necessary aliment. A hundred date-palms are said to require the labour of *one* man for three months a year. The lower decayed leaves are removed once a year.

18. The practical native, employed on the Domains, gives the following names of distinct kinds : Hayani, A'rabiate, Kababi, Bind Eysha, Zanar, Sergni, Rawaked, Samuni, Zaghlaul, Chetich, O'm Nasreddin, A'layly, Amri, Chihayet, A'koula, Mokarba, Bemeri, Zokour, Boimaghal, Abrimi, Sokant, Hafer-el-Gnedi, Bezelnaka, Sobazenab, Gandila, Khodrawy, El Siwy, El Wahy, and others. The best

of these, however, are Zaghlaul, El Amri, El Sokaut, El Gandila, El Khodrawy, El Abrimi, and El Siwy. Mr. Biancardi says the best varieties are Ghazali, Hayani, Amri, Aklawi, Beyd-el-Gamal, Bint Eysha and Eglani. While Wilson Bey, the Scotch Mechanical Engineer, says the best of all is the *Amhat*, a small brown date grown at Gizeh, on sandy soil, which is not inundated. Then comes the *Amri*, a fine large date, black when ripe. When ripe, it bears transport to the Levant, Greece and other parts of Europe. It grows in Shirkieh, Fakoos, Salhieh, and Abu-Kebir. *Samuni*, a large yellow date when ripe. It grows in sandy soil about Rosetta, and is not inundated. *Zaghlaul*, a fine rich date, sometimes plucked and eaten in its red and unripe state. It is also grown on sandy soil near Rosetta. The following he gives as inferior dates, *viz.*: *Hyani*, a coarse date, often eaten unripe and red. It grows on clayey soil, in the Calioubieh. It is sometimes inundated. *Bint Eysha*, a small date, known all over the lower country, and grown in artificially-irrigated districts. *Aglani*, grown on clayey soil and irrigated parts of the Shirkieh.

19. Mr. Biancardi, who is not only a practical man of business, but also a horticulturist, gives the following details in his notes, which may be of some value: "The young trees should be obtained from Abuhammed, Oren, or Salhieh, detached from the parent tree. They generally stand from four to five feet high, and are about three years old. They are wrapped up in palm-tree fibre, and transplanted in January and February. They would stand the voyage to Bombay well. They would only require the envelope over their roots damped once a day. On arrival at destination they should be planted in deep holes, one for each, up to their bottom leaf. The tree is then to be wrapped up in old matting, and watered every day for 40 consecutive days, and then on alternate days, till four months are over. The roots are then supposed to be long enough to feed themselves, and the trees are then treated like any other fruit-tree. Such a thing as a full-grown tree dying for want of water is not known. A *nakhal* or two (date tree cultivators) should be engaged to go with them, and carry out the process. They would teach the Indians in two or three years how to deal with these trees. In about five years 20,000 Egyptian trees, treated as explained, would yield £10,000 a year (according to Egyptian reckoning). The cost of 20,000, at a shilling each, would be £1,000. Their total weight would be 1,000 tons. They could reach India and be planted for the amount of £3,000 all told. They would require 200 acres of waste and poor land, which might be purchased for a small sum. Taking into consideration the four or five years which will have to elapse before they fruit, and the interest on the capital engaged, the total amount expended before the first crop would probably reach £6,000. Admitting that half the trees would die, or be fruitless, the other 10,000, producing half crop only, would represent £5,000 revenue for the first year. The first crops of a date tree are not large. Some give one and some two bunches the first year. The number of bunches continue to increase till the trees reach the age of 15 years, when they will give as many as 10 to 12 bunches." Mr. Biancardi may have added that, with care, a date-tree will go on producing this amount *annually* for 100 years or more.

20. No one probably is going to try date-planting in India on this scale; but it is not improbable that some of the Rájputána Chiefs, or His Highness the Nizam of Hyderabad, might be inclined to try the experiment on a small scale, and engage a couple of Egyptians to accompany the young trees, and treat them as they do in Egypt. Sir R. Temple, in his "Journals of Hyderabad," says: "Below the Manjhera Valley, and between the rivers Manjhera, Bhima and Kristna, lies the most important part of the Nizam's Dekkan. This area comprises marked variations of contour, soil, and climate, and is either studded with hills or else literally fluctuates with undulations. The eastern portion is dotted over with artificial lakes or reservoirs, constructed by the Hindu dynasties, and known as tanks. Indeed it is the finest scene of tank irrigation in all India, and it is here that the Pakhal lake is situated, which is probably the largest sheet of water in the Peninsula." He goes on to say: "Geologically speaking, it may be said in general terms that in the north and west blackish trap and dark heavy soils prevail; while in the remainder, that is, the south-east portion, reddish granite and laterite rocks and lighter soils prevail. These geological divisions affect the agriculture and produce in the most marked manner, for in the black soils are raised cotton and wheat, while the red soils produce the spring and autumn harvests of rice, dependent entirely on 'tank' irrigation. Hence it is that even in this land of 'tanks,' the light soil districts are *par excellence* those of the artificial lakes." According to the above description, the Nizam's territories would appear to be cut out by nature for the successful growth of the Egyptian date-tree on a large scale. After the trees had taken root, the tank-water infiltration would afford them the sub-soil moisture they delight in; while growing both cotton and wheat might be grown between the young date-trees, and when fully grown, oranges, lemons, and fig-trees, &c., might be grown under their shade, as is done in Tunis. From what I saw of the Nizam's territory, I believe that in that fertile soil where water would be available, many of the European fruit trees might be successfully

grown, and with regard to date-trees, not only those grown in Egypt on the higher land might succeed, but also those grown on lower lands, and would in time feed the people of the Dekkan for several months in the year.

21. In all my researches about the date-trees, I have endeavoured to combat and get rid of the exploded notion that, unlike many others, the date-tree is a fixed and unchangeable organism, as fixed as the notion books and people have got of it. Actual facts, however, show that within certain limits it has adapted itself in course of time to its surroundings in Egypt and other places. From a tree luxuriating in a desert climate, it has suited itself to soils subject to inundation, for several months; to the vicinity of the sea, to saline soils, &c.; in some localities producing the finest dates; in others inferior ones; but *everywhere* feeding the people and their cattle. We need not go very far to search for a plant that has been far more yielding to circumstances than this. The rice-plant is admittedly a tropical plant largely grown in Burma, Ceylon, South India, and Bengal. Nevertheless, out of the hundred and more varieties of rice, some have adapted themselves to the climate of Northern India, as far as Peshawar to that of the valleys of the interior of the Himalayan mountains; to that of Afghanistan, Italy, America and others; and no doubt that among the hundred and more varieties of date-trees some are suited to a dry, some to a moist climate; others to a sandy, a clayey, or a saline soil, &c.

22. The date crop in Egypt ripens in September; and in case the Government of India should think fit to import some Egyptian seeds of the best varieties, I beg to add the following information given also in Colonel Scott Moncrieff's letter: "In order to have seeds sent out on really a large scale to India, I should think it would be best to act through Government. If Sir Evelyn Baring were asked officially, I should think he would place the matter in the hands of Mr. J. R. Gibson (formerly Bombay Revenue Survey), Commissioner of the State Domains, and Mr. Hamilton Lang, C. M. G., Controller of the Daira Sanieh. Either of these officers is in a position to get any quantity of date-seeds. There would be some little expenditure of course, or it might be done by the Government of India through some good merchant-house, like that of Messrs. Carver & Co., of Alexandria, well-known and highly-respected export merchants."

23. Besides the Oudh date-trees, fruiting palms are to be found in India in various places by ones and twos, originally introduced from Mecca and other places in Arabia. A few scattered trees here and there, however, are not sufficient to induce any one to set about cultivating the date-tree in a proper methodical manner. A few Egyptian and Persian date cultivators might do much towards teaching the natives of India how to set about this culture, so well understood in those places. That it is possible to introduce this important tree in India on a large scale, and that it will be of great benefit to the people, I have no doubt. Moreover, Mr. Thiselton Dyer, the Director of the Royal Gardens, Kew, in a letter dated 15th November 1886, says: "I am sure this enterprise is a sound one." In conclusion, whatever may be the value of the date-produce in India in ordinary times, there is, I think, no question that, in famine times, a crop of dates would be a certainty.